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Space Engineering - Thermal design handbook - Part 4: Conductive Heat Transfer

Raumfahrttechnik - Handbuch für thermisches Design - Teil 4: Konduktive Wärmeübertragung

Ingénierie spatiale - Manuel de conception thermique - Partie 4: Transfert de chaleur par conduction thermique

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## Space Engineering - Thermal design handbook - Part 4: Conductive Heat Transfer

Ingénierie spatiale - Manuel de conception thermique -  
Partie 4: Transfert de chaleur par conduction  
thermique

Raumfahrttechnik - Handbuch für thermisches Design -  
Teil 4: Konduktive Wärmeübertragung

This draft Technical Report is submitted to CEN members for Vote. It has been drawn up by the Technical Committee CEN/CLC/JTC 5.

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## European Foreword

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This document (FprCEN/CLC/TR 17603-31-04:2021) has been prepared by Technical Committee CEN/CLC/JTC 5 "Space", the secretariat of which is held by DIN.

This document is currently submitted to the Vote on TR.

It is highlighted that this technical report does not contain any requirement but only collection of data or descriptions and guidelines about how to organize and perform the work in support of EN 16603-31.

This Technical report (FprCEN/CLC/TR 17603-31-04:2021) originates from ECSS-E-HB-31-01 Part 4A.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This document has been developed to cover specifically space systems and has therefore precedence over any TR covering the same scope but with a wider domain of applicability (e.g.: aerospace).

**This document is currently submitted to the CEN CONSULTATION.**

# 1

## Scope

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This Part 4 of the spacecraft thermal control and design data handbooks, provides information on calculating the conductive heat transfer rate for a variety of two and three-dimensional configurations.

Calculations for the conductance of the interface between two surfaces (joints) require special consideration and are included as a separate clause.

The Thermal design handbook is published in 16 Parts

TR 17603-31-01	Thermal design handbook – Part 1: View factors
TR 17603-31-02	Thermal design handbook – Part 2: Holes, Grooves and Cavities
TR 17603-31-03	Thermal design handbook – Part 3: Spacecraft Surface Temperature
TR 17603-31-04	Thermal design handbook – Part 4: Conductive Heat Transfer
TR 17603-31-05	Thermal design handbook – Part 5: Structural Materials: Metallic and Composite
TR 17603-31-06	Thermal design handbook – Part 6: Thermal Control Surfaces
TR 17603-31-07	Thermal design handbook – Part 7: Insulations
TR 17603-31-08	Thermal design handbook – Part 8: Heat Pipes
TR 17603-31-09	Thermal design handbook – Part 9: Radiators
TR 17603-31-10	Thermal design handbook – Part 10: Phase – Change Capacitors
TR 17603-31-11	Thermal design handbook – Part 11: Electrical Heating
TR 17603-31-12	Thermal design handbook – Part 12: Louvers
TR 17603-31-13	Thermal design handbook – Part 13: Fluid Loops
TR 17603-31-14	Thermal design handbook – Part 14: Cryogenic Cooling
TR 17603-31-15	Thermal design handbook – Part 15: Existing Satellites
TR 17603-31-16	Thermal design handbook – Part 16: Thermal Protection System

## 2 References

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EN Reference	Reference in text	Title
EN 16601-00-01	ECSS-S-ST-00-01	ECSS System - Glossary of terms

All other references made to publications in this Part are listed, alphabetically, in the **Bibliography**.

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## Terms, definitions and symbols

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### 3.1 Terms and definitions

For the purpose of this Standard, the terms and definitions given in ECSS-S-ST-00-01 apply.

### 3.2 Abbreviated terms

The following abbreviated terms are defined and used within this Standard.

ED	flatness deviation, [m]
RD	roughness deviation, [m]
TWL	total weight loss, percent
VCM	volatile condensable materials, percent by weight

Other symbols, mainly used to define the geometry of the configuration, are introduced when required.

### 3.3 Symbols

<i>A</i>	cross-sectional area normal to temperature gradient, [m <sup>2</sup> ]
<i>E</i>	modulus of elasticity, [Pa]
<i>L</i>	length normal to the plane of the figure in two-dimensional configurations, [m]
<i>M</i>	surface hardness, [Pa]
<i>P</i>	applied compressive load, also called contact pressure, [Pa]
<i>Q</i>	heat transfer rate, [W]